

REMARKS

Claims 1-9 are all the claims pending in the application.

Claim rejections under 35 U.S.C. § 112, second paragraph

Claims 1-9 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner concedes that it is well known that non-linear effects occur when launching an optical pump signal at a certain power level into an optical fiber (page 2 of the Office Action). Furthermore, it is well known in the art that the optical power has to be below a threshold at which non-linear effect becomes predominant and this non-linear effect depends on the actual case (type of fiber, wavelength, number of channels etc.). Hence, it would not be possible to define a mathematical relation, but the relevant threshold can be easily determined in the field without undue experimentation.

For instance, amplifier control is a well known issue and one of ordinary skill in the art would know how to set the amplification properly to avoid non-linear distortions. One well known way amplifier control is implemented is the following. The signal is measured at the far end and the result communicated back via a control channel. The pump power is then reduced until the signal is received free of distortions or increased until the signal is received at a sufficient level.

In view of the above, Applicant submits that the features of the apparatus defined by the claims 1, 4 and 8 are sufficiently clear and definite, and reconsideration and withdrawal of this ground of rejection is requested.

Claim rejection under 35 U.S.C. § 103(a)

Claims 1-6, 8 and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Shikada et al. (U.S. Patent No. 5,432,629, hereinafter "Shikada"). Applicant traverses the rejections at least for the following reasons.

Claim 1

Claim 1 recites, *inter alia*, wherein, said frequency shift keying modulation, has a modulation index $h < 1/2$, and an optical power of said modulated optical signal launched into the optical fiber is such that a non-linear transmission effect occurs in the transmission of the modulated optical signal by the optical fiber.

The Examiner asserts that in column 1, lines 54-68 to column 2, lines 1-12 and lines 37-15, Shikada discloses an optical power of said modulated optical signal launched into the optical fiber is such that a non-linear transmission effect occurs in the transmission of the modulated optical signal by the optical fiber, and said modulation index h being defined as maximum frequency separation of said digital signal divided by the bitrate of said digital signal. Moreover, the Examiner admits that Shikada does not disclose that the frequency shift keying modulation has modulation index $h < 1/2$. However, the Examiner asserts that Shikada suggests that modulation index is adjustable and it would have been obvious to one skilled to adjust the modulation index to be within the predetermined value such as less than $1/2$.

First, Applicant submits that Shikada does not disclose an optical power of said modulated optical signal launched into the optical fiber is such that a non-linear transmission effect occurs in the transmission of the modulated optical signal by the optical fiber.

In the portion cited by the Examiner, Shikada discloses a means for controlling the modulation index of a modulated light beam to be stable by using feedback signal which is generated by a control signal producing means coupled with a feedback means. Moreover,

Shikada discloses that the control signal producing means has a transmission characteristic such that a peak value appears at a preselected frequency (column 2, lines 2-4). Furthermore, Shikada discloses that the first additional modulated light beam is assumed to be linear polarized light beam (column 6, lines 13-17). In view of the above, Applicant submits that Shikada does not disclose an optical power of said modulated optical signal **launched into the optical fiber is such that a non-linear transmission effect occurs** in the transmission of the modulated optical signal by the optical fiber.

Second, with regard to the Examiner's assertion that it would have been obvious to one skilled to adjust the modulation index to be within the predetermined value such as less than $1/2$, Applicant submits that the claimed range is critical because the claimed range achieves unexpected results relative to the prior art range. Guidelines set forth in the MPEP § 2144.05 states that "Applicant can rebut an presumption of obviousness based on a claimed invention that falls within a prior art range by showing ... that there are new and unexpected results relative to the prior art."

As it is described in the specification, using a lower modulation index $h < 1/2$ unexpectedly reduces the signal distortion at higher power levels (i.e. 10 dBm and 20 dBm) (second full paragraph, lines 9-12 of the specification). Moreover, it was well known in the art to one of ordinary skill at the time of the invention that $h = 1/2$ is the minimum modulation index for frequency shift keying that should be applied. Furthermore, even though Shikada discloses that the modulation index can be predetermined, Shikada only illustrates the modulation index to be around 0.75 and does not disclose or remotely suggest using modulation index less than $1/2$. Therefore, it would not have been obvious to one skilled in the art at the time of the invention to adjust the modulation index to be within the predetermined value such as less than $1/2$.

Applicant submits that the features of claim 1 recognizes that such non-linear distortions can be exploited to benefit when the modulation index is chosen to $m < 0.5$. Therefore, claim 1 recites setting the amplification level above the threshold at which distortions occur. A modulation index < 0.5 and pump power in the regime where non-linear distortions occur are recited in claim 1, both of which are unusual. Therefore, Applicant submits that the combination is neither known nor obvious at all.

In view of the above, Applicant respectfully request the Examiner to withdraw the rejection of claim 1.

Claims 4 and 8

Claims 4 and 8 recite, *inter alia*, wherein said frequency shift keying modulation has a modulation index $h < 1/2$, and said optical transmitted is configured to launch the modulated optical signal into the optical fiber with an optical power set such that a non-linear transmission effect occurs in the transmission of the modulated optical signal by the optical fiber. Applicant submits that claims 4 and 8 recite subject matter similar to claim 1 that is shown to be allowable, and therefore claims 4 and 8 are also allowable at least for the same reasons claim 1 is allowable and additional limitations therein.

Dependent claims 2 and 3

With regard to claim 2, Applicant submits that it would not have been obvious to set the modulation index h in the range between $1/2$ and $1/4$ at least for the reason given above with respect to claim 1.

With regard to claim 3, Applicant submits that it would not have been obvious to set the modulation index h is $1/3$ at least for the reason given above with respect to claim 1.

Furthermore, Applicant submits that claims 2 and 3 depend from independent claim 1 that has been shown to contain allowable subject matter, and therefore should be allowed at least by virtue of their dependency and the reasons given above.

Dependent claims 5, 6 and 9

Claims 5 and 6 depend from claim 4 and claim 9 depends from 8. Therefore, Applicant respectfully requests the Examiner to withdraw the rejections of these claims at least by virtue of their dependency on claims 4 and 8 that are shown to be allowable.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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